

Commonwealth of Kentucky
Division for Air Quality
EXECUTIVE SUMMARY

PROPOSED

Title V / Synthetic Minor, Construction / Operating

Permit: V-06-052 Revision 1

ISP Chemicals, LLC

Calvert City, KY 42029

September 2, 2008

Andrew True, Reviewer

SOURCE ID: 21-157-00003

SOURCE A.I. #: 2939

ACTIVITY ID: APE20080001

SOURCE DESCRIPTION:

ISP Chemicals Inc. (ISP) is a large Synthetic Organic Chemical plant that makes a wide variety of intermediates and specialty chemicals. The source is a major source, as defined by 401 KAR 52:020 Title V Permits, for the potential emissions of over 100 tons per year of sulfur dioxide (SO₂), nitrogen oxides (NO_x), carbon monoxide (CO), and volatile organic compounds (VOC), the potential of a single hazardous air pollutant (HAP) greater than 10 tons per year, and the potential combined HAP emissions greater than 25 tons per year.

The source is also a major source, as defined by 401 KAR 51:017 Prevention of Significant Deterioration of Air Quality (PSD), for potential emissions of over 100 tons per year of SO₂, NO_x, CO and VOC.

ISP applied on January 2, 2008 to incorporate requirements from 40 CFR 63 Subpart FFFF Miscellaneous Organic Chemical Manufacturing (MON) into permit V-06-052. Pursuant to 63.2445(b), the permittee shall comply with the requirements for existing sources not later than May 10, 2008. Under the provisions of 40 CFR 63.6(i)(9), the Division has granted a six-month compliance extension for the Group 1 process wastewater stream requirements of 40 CFR 63.2485. The facility must comply with the Group 1 process wastewater stream requirements of 40 CFR 63.2485 no later than November 10, 2008.

For the purpose of Title V permitting, this facility is split into the following areas:

1. **Gamma-butyrolactone (BLO) unit:** BLO is produced by vapor phase dehydrogenation of butanediol in a fixed-bed catalytic reactor. Crude BLO is distilled, purified, cooled, and stored. High boiling residues are removed as non-hazardous waste and shipped off-site for Btu recovery. Lights are sent to the comparable fuels tank for subsequent Btu recovery in ISP's boilers. By-product hydrogen is vented to the boilers for Btu recovery, or vented to the atmosphere. Wastewater is sent to the on-site wastewater treatment plant.
2. **Pyrrolidones unit:** 2-Pyrrolidone is produced by the reaction of anhydrous ammonia and BLO. The crude product is sent to a distillation unit, BLO is also reacted with an alkylamine to form a substituted pyrrolidone. Crude product is cooled and distilled in Area 315, or Area 211, or sent to a toll processor.

3. **Vinyl Pyrrolidone unit:** Vinyl Pyrrolidone (VP) is produced by reacting 2-pyrrolidone with acetylene. Potassium hydroxide is used as a catalyst. Propane is used as an inert diluent. The crude VP is purified by distillation, and unreacted 2-pyrrolidone is recycled to the reactor. Some VP is stabilized and stored in tanks. The balance of the VP is used to make other products downstream of this process.
4. **Solvent recovery unit:** The distillates from the Gantrez ES-225 and ES-425 processes are separated into acetone and ethanol. Purge streams containing alcohols and ketones are combined and used in the boilers as comparable fuels. Ethanol is re-used in the Gantrez process.
5. **Methyl vinyl ether unit:** Acetylene is purified, mixed with methanol vapor, and fed to the reactor (vinylator). The catalytic reaction produces crude methyl vinyl ether (MVE), which is then purified, condensed, washed, and dried. MVE is reclaimed by removing the contaminant acetaldehyde. Since production of virgin MVE and MVE reclamation use some of the same equipment, the two processes cannot currently run simultaneously.
6. **Storage tanks**
7. **200 Building:** The 200 building is used to produce several products, each with many grades. Several grades of alkylated polyvinylpyrrolidone (Ganex) are produced by charging the reactor with VP, an olefin, an initiator, and alcohol as a diluent. After the reaction, the batch is cooled. When the desired solids content of the batch is achieved, the product is filtered, cooled, and packaged. Several grades of Polyvinylpyrrolidones (PVP) are produced by batch polymerization of n-Vinyl-2-Pyrrolidone (VP).
8. **236 Building:** Many different batch processes are conducted in the 236 building. The 236 building also uses some materials produced in the 240 building. Solution products are shipped out via tank trucks or drums. Dried products are packaged in drums or totes.
9. **240 Building:** Building 240 produces copolymers of maleic anhydride (MA), methyl vinyl ether (MVE), isobutylene, and isopropyl acetate. The reactions use various proportions of reactants, solvents, and initiators. Product slurry is generated in the four reactors, stripped of un-reacted monomer (if needed) in the stripping tanks, and then pumped to holding tanks that feed into the three product dryers. Dried powder is mixed in six blenders, and packaged into drums, totes, super sacks, or air pallets. Some reactor products are not dried, but are transferred to tanks for storage or transferred directly to downstream processes.
10. **315 Building:** In the 315 building copolymers of PVP are produced. VP and a solvent are charged to the reactor. The remaining amounts of VP and solvent are added followed by the initiator. When the monomer concentrations are below the specifications, the batch is cooled. The solids are adjusted after mixing with an additive. The product is then loaded into drums. Gafquats are produced when VP is copolymerized with various organic salts in presence of an initiator. Water or ethanol is typically used as a solvent. The solids are adjusted, filtered, and the final product is packed into drums. Batch products other than the above vinyl pyrrolidone-based products are also made in the 315 building. Solution products are shipped out via tank trucks and drums. Dried products are packaged in drums or totes.

11. **Higher vinyl ethers (HVE) unit (326 area):** A variety of high molecular weight vinyl ethers are produced in a batch process in the 326 Area. Raw materials are heated to reflux in a prep kettle. Using the prep kettle vacuum, a solution of potassium hydroxide (KOH) is drawn into the kettle from the melt pot. The reaction occurs by sparging a mixture of acetylene / propane through the batch. Unreacted gas from the top of the reactor is released through a cooler to a buffer tank where acetylene / propane is added. Vapors from the gas in the cooler are separated and returned to the reactor. The batch is then transferred to the degasser, where residual acetylene / propane is removed by sparging with nitrogen. After sparging, the degasser is discharged either to the unit, a tank wagon, or to drums.

12. **334 Building:** PVP-I is prepared in the 334 building by reacting iodine prills with PVP powder. The reaction occurs at controlled conditions in a tumbler mixer to form an iodide complex in the presence of water. The slurry is then spray dried and packaged into drums.

13. Wastewater treatment

14. Utilities / R&D

The application includes an extension for the following project:

- Construction of new reactor and dryer in 240 Building. Since uncontrolled emissions are over 40 tpy for VOC, the facility has accepted operating limits to preclude applicability of PSD.

PUBLIC AND AFFECTED STATE REVIEW:

On July 30, 2008, the public notice on availability of the draft permit and supporting material for comments by persons affected by the plant was published in the *Marshall County Tribune - Courier* in Benton, Kentucky. The public comment period expired 30 days from the date of publication.

Comments were received from The Coalition for Health Concern, Inc. in Benton, Kentucky on August 25, 2008 and ISP Chemicals LLC on September 02, 2008. Attachment B lists the comments received, the Division's response to each comment, and a detailed explanation of the changes made to the permit. Minor changes were made to the permit as a result of the comments received; however the Division has concluded that the proposed operation will comply with all air quality regulations and requirements. Therefore, the Division has made a final determination to issue a proposed permit. A final permit will be issued after the U.S. EPA's 45-day review.